March 20, 1973

ERTS Contracting Officer
Code 245, GSFC
Greenbelt, Maryland 20771

Subject: Type I Progress Report No. 3

Period Covered: 1 January 1973 - 28 February 1973

Title: A Scheme for the Uniform Mapping and Monitoring of Earth Resources and Environmental Complexes Using ERTS-1 Imagery

GSFC ID: PR 534

Objectives

To develop, test and specify a practical procedure and system for the uniform mapping and monitoring of natural ecosystems and environmental complexes from space-acquired imagery.

With primary emphasis on ERTS-1 imagery, but supported by appropriate aircraft photography as necessary, our objective furthermore is to accomplish the following:

1. Develop and test in a few selected areas of the western United States a standard format for an ecological and land use legend for making natural resource inventories on a simulated global basis.

2. Based on these same limited geographic areas, identify the potentialities and limitations of the legend concept for the recognition and annotation of ecological analogues and environmental complexes.

An additional objective is to determine the optimum combination of space imagery, aerial photography, ground data, human data analysis and automatic data analysis for estimating crop yield in the rice growing areas of California and Louisiana.

Major Accomplishments

1. We prepared a paper for presentation at the March ERTS-1 Symposium under the title, "An Interregional Analysis of Natural Vegetation Analogues Using ERTS-1 Imagery." The abstract of that paper is repeated as follows:

> "We are seeking to determine if ecological analogues of natural vegetation and a key food crop, rice, have sufficiently analogous signatures to be interregionally and potentially globally identifiable from ERTS-1 imagery. In the proper seasons, rice does have a unique signature in one of our test sites and we have identified within-field variation that is production related. We have also demonstrated unique signatures for four natural vegetation analogues from color prints and are developing some promising color additive analytical techniques to support this and other projects. Even the limited progress is encouraging with respect to feasibility of a uniform ecological inventory of vegetational resources with ERTS imagery."

2. We submitted and received approval on a detailed Data Analysis Plan for the project.

Vegetational Analogue Studies

1. We are continuing to work on the two problem legend areas, Savanna-like Types, 330, and Forest and Woodland Types, 340, to identify and characterize consistent classes at tertiary and quaternary levels

that have a maximum chance of successful and consistent application in the interpretation of ERTS imagery. All other legend classes and our first- and second-order classes for environmental features are continuing to work well in ERTS interpretation.

2. We have demonstrated that analogues of certain dense vegetation types do produce unique identifiable signatures among ERTS frames within our Colorado test site when properly combined on an I^2S color combiner and that these images can be repeated on subsequent setups by careful attention to dial settings. One of the problems is achieving equal repeatability where photographic copy of the scene is necessary. It appears that practically all dense vegetation images will be identifiable at tertiary level, that is, on physiognomic and structural criteria. From a single season's imagery we are, however, encountering problems in separation of some tertiary- and many quaternary-level analogues. These problems increase as vegetation density decreases and surface soil or rock type differences begin to override the vegetation in the integrated signature from ERTS.

3. We are collaborating with IBM in some limited digital data analysis of one site in our Sierra-Lahonton area to see if solutions to these and similar problems that plague the human interpreter are possible through digital data classification.

4. Langley, under another ERTS participation project, has developed some I^2S color combining techniques for enhancing temporal change in vegetation. These techniques will be helpful to us when we can get a better representation of the seasonal development in our vegetation

areas. Some of the single-season identification problems may be easily resolvable when the proper combination of seasons can be examined together.

Rice Analogue Studies

1. Final preparations have been completed for commencing the field activities for the 1973 rice growing season in California and Louisiana. Extension services and experiment station personnel have been alerted to our schedule and needs for data.

2. Maps and photographic materials for EarthSat aerial photography have been obtained.

3. A scheme for handling and interpreting ERTS-1 photos has been prepared to optimize the extraction of data and the necessary activities related to data collecting.

4. Coverage maps for U-2 flights have been submitted to NASA/Ames.

Plans for Next Reporting Period

Work in preparation of color reconstitutions and data analysis for the vegetational analogues will continue according to plan. Some field work may begin depending on vegetational development with the approach of the spring season.

During the month of March we will begin to collect data in the field for the Louisiana rice study. Field preparation and rice crop planting will begin early in March in Louisiana and in mid April in California.

A flight is planned to Louisiana in the middle of the next reporting period during the field preparation stages to support aerial photos of the test fields.

Final selection of cooperating rice farmers in Louisiana will be made during that visit. Data on the planting date, variety planted and method of planting rice will be collected when available from the growers.

Briefings on the project activities and the data desired from the growers will be given to the cooperators at the earliest opportunity.

Problems

The only remaining problem of serious consequence is failure to receive color composites that have been on retrospective order from GSFC since October 1972. While our project was designed to emphasize human interpretation from the standard color combined product, it now appears that the only realistic solution must be to find alternatives to the use of NASA-produced color prints. We think we can do this by reliance on our own in-house capabilities with the I^2S color combiner and photographic color reconstitution, although the latter will have to be used with high selectivity because of the costs involved.

Personnel

No change.

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